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(54) Title: METHOD AND SYSTEM FOR PROVIDING ROAMING FOR A DATATERMINAL BETWEEN LOCAL NETWORKS CONNECTED TO A CONTROL COMMUNICATION NETWORK

(57) Abstract: Devices, a procedure and a system for making possible of roaming for a data communication terminal (140) between local data communication networks (102, 103) which are connected to a central data communication network (101), are described. Local data communication devices (110, 111) are connected to a local data communication network each (102, 103) and to the central data communication network and central data communication devices (120, 121, 122) are connected to the central data communication network. A central control unit (130), which is connected to the central data communication devices via the central data communication network, associates the data communication terminal with a current central data communication device (120) and informs the current central data communication device about this. The current central data communication device allocates a temporary address to the data communication terminal. A current local data communication device (110) detects that the data communication terminal is connected to the local data communication network (102), to which the local data communication device is connected and informs about this to the current central data communication device. The current central data communication device by that looks after which local data communication network the data communication terminal is connected.

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METHOD AND SYSTEM FOR PROVIDING ROAMING FOR A DATA TERMINAL  
BETWEEN LOCAL NETWORKS CONNECTED TO A CONTROL COMMUNICATION  
NETWORK

5 TECHNICAL FIELD

The present invention generally relates to roaming between data communication networks. More exactly, the present invention relates to data communication devices, a system and a procedure for making roaming possible for a data communication terminal between local data communication networks which are connected to a central data communication network.

PRIOR ART

15 A user of a mobile terminal for packet switched data communication, such as a portable computer, hand computer, mobile telephone etc normally moves physically between different network segments, such as local data communication networks. It is in this case talked about roaming for the mobile terminal between local data communication networks. To make the packet switched communication possible, the mobile terminal must have an address, such as an IP-address in the case with data communication over an IP-protocol.

25 There today exist systems for such roaming where an address is allocated in the network segment to which the user's mobile terminal at the time being is connected. In this case problems will arise with maintaining data communication sessions in progress when the mobile terminal is connected to a new network segment.

35 In other systems for roaming the mobile terminal has a permanent IP-address. All data communication to and from the mobile terminal is passing via these systems via a connecting node which is located in the user's home network. This, however, will result in annoying delays at data communication between the mobile terminal and another

terminal which is located close to the mobile terminal in the case when the mobile terminal is located at a large distance from its home network.

## 5 SUMMARY OF THE INVENTION

The aim of the present invention is to solve above mentioned problem that data communication sessions are negatively influenced when a mobile terminal is moved from one network segment to another network segment and that the  
10 delays in the data communication occur at roaming.

The invention is among other things based on the knowledge that the responsibility for the handling of roaming neither shall be connected with the local network to which a data communication device is connected at a  
15 given point of time, or with a central unit to which the data communication device is permanently connected.

According to a first aspect of the invention, a data communication device is provided which is connected to a central data communication network, for handling of roaming  
20 for a data communication terminal between local data communication networks which are connected to the central data communication network. The data communication device includes a reception device for reception of current association information which indicates that the data  
25 communication terminal is associated with the data communication device and for reception of current roaming information which indicates a current local data communication device which is connected to a local data communication network to which the data communication  
30 terminal is connected. The data communication device further includes a storing device for storing of the current association information, and the current roaming information, an address handling device for allocation of a temporary address to the data communication terminal, and a  
35 routing device for routing of a data packet, which has the

data communication terminal as receiver, to the current local data communication device.

According to the first aspect of the invention consequently a data communication device is provided to which the data communication terminal can be associated temporarily. The data communication device further is not connected only to the current local data communication network to which the data communication terminal is connected. Instead the data communication device receives/ obtains current roaming information regarding the data communication terminal and consequently looks after where data packets, which have the data communication device as receiver, shall be routed. Further possibility for utilization of a plurality of data communication devices which can be arranged regionally in the central data communication network is offered. By this the problems with delays, which occur in known systems where data packets are routed via a connection node in the home network of the data communication terminal which can be located far from the current local data communication network to which the data communication terminal is connected, are removed.

The address handling device is preferably arranged to allocate a temporary address which is selected among a plurality of addresses which are specific for the data communication device. By the temporary address being selected in this way it will be possible to, by inspection of the address of the data communication terminal, see that it is associated with the data communication device.

The current roaming information further preferably indicates if the data communication terminal ceases to be connected to the local data communication network to which the current local data communication device is connected and the routing device after such information cuts off/stops the routing of data packets, which have the data communication terminal as receiver, to the current local data communication device. By the data communication device

being informed about that the data communication terminal is no longer connected to a local data communication network, it can for instance buffer data packets which have the data communication terminal as receiver. This occurs  
5 for instance when the data communication terminal is moved from one local data communication network to another. When the data communication terminal is connected to the new local data communication network, the data communication device will receive current roaming information which  
10 indicates a new current local data communication device which is connected to the new local data communication network to which the data communication terminal is connected. The routing now can be resumed and buffered data packets be routed to the new current local data  
15 communication device.

Further the address handling device is preferably arranged to set the temporary address free after one in advance predetermined time from that current roaming information is received which indicates that the data  
20 communication terminal has ceased to be connected to the local data communication network to which the current local data communication device is connected. A condition for that this shall occur, however, is that no current roaming information which indicates a new current local data  
25 communication device which is connected to a local data communication network to which the data communication terminal is connected has been received meanwhile. In the cases when the data communication terminal is not connected to any new local data communication network, the data  
30 communication device will not receive any new current roaming information. That the temporary address then is set free after one in advance determined period of time results in that the using of addresses in the network can be limited. The number of addresses which are used for data  
35 communication terminals is mainly equal to the number of

data communication terminals which are connected to the network.

The current roaming information preferably also indicates the address to the current local data communication device. The routing device is in this case arranged to assemble data packets which have data communication terminal as receiver, in a tunneling data packet each. The tunneling data packets have the address of the data communication device as transmitter address, and address of the current local communication device as receiver address. By the routing being made to the current local data communication device it is sufficient that the address of the current local data communication device is known in the central data communication network. Data packets, which are addressed to the data communication terminal, which are received in the data communication device, are there routed forward to the current local data communication device.

According to a second aspect of the invention a data communication device is provided which is connected to a local data communication network and to a central data communication network, to make roaming possible for a data communication terminal between local data communication networks. The data communication device includes a detection device for detection of that the data communication terminal is connected the local data communication network, and a reception device for reception of current association information, which indicates a current central data communication device, to which the data communication terminal is associated. The data communication device further includes a transmission device for transmission of current roaming information, which indicates that the data communication terminal is connected to the local data communication network and a routing device for routing of data packets which have the data communication terminal as transmitter/sender.

By the data communication device according to the second aspect receiving the association information, which indicates the current central data communication device of a plurality of central data communication devices, and  
5 transmits current roaming information, the data communication device need not allocate any address to the data communication terminal, which address is associated to the local data communication network to which the data communication device is connected. Instead the address can  
10 be allocated by the current central data communication device. This results in that the data communication terminal can be connected to another local data communication network without negative influence of data communication sessions in progress which relates to the  
15 data communication terminal.

The detection device is preferably also arranged to detect that the data communication terminal ceases to be connected to the local data communication network. The transmission device is in this case further arranged to  
20 transmit current roaming information which indicates that the data communication terminal has ceased to be connected to the local data communication network. This facilitates the location of a data communication terminal when it is connected to a new local data communication network by that  
25 the current central data communication device, in addition to current roaming information from a data communication device, which is connected to the new local data communication network, which current roaming information indicates that the data communication terminal is connected  
30 to the new local data communication network, also will have current roaming information which indicates that the data communication terminal is no longer connected to the old local data communication network. If the connection to the new local data communication network is not made directly,  
35 the current central data communication device can cut off the routing of data packets, which have the data

communication device as receiver, to the data communication device which is connected to the old local data communication network. The current central data communication device then resumes the routing when current  
5 roaming information is received which indicates that the data communication terminal has been connected to the new data communication network. Further this makes possible that the current central data communication device, when current roaming information is received which indicates  
10 that the data communication terminal is no longer connected to the old local data communication network and no current roaming information is received which indicates that the data communication terminal is connected to a new local data data communication network during one in advance  
15 determined period of time, to ascertain that the data communication terminal is no longer active.

The routing device further is preferably arranged to assemble data packets which have the data communication terminal as transmitter, in a tunneling data packet each  
20 which has the address of the data communication device as transmitter/sender address and the address of the current central data communication device as receiver address. This is of advantage in local data communication networks where data packets with a transmitter/sender address which is not  
25 associated to the local data communication network are not allowed to be transmitted. By the data packets being assembled in a tunneling data packet, which has the data communication device as transmitter/sender, the data packets consequently can be allowed to be transmitted.  
30 Roaming which does not utilize allocation of an address to the data communication terminal, which address is associated to the local data communication network consequently can be realized without changes in existing equipment in the local data communication network, but only  
35 by addition of the data communication device.



According to a third aspect of the invention a system to make roaming possible for a data communication terminal between local data communication networks which are connected to a central data communication network is provided. The system includes local data communication devices, which are connected to a local data communication network each and to the central data communication network, central data communication devices, which are connected to the central data communication network and a central control unit, which is connected to the central data communication devices via the central data communication network. The central control unit includes association devices for association of the data communication terminal with a current central data communication device and transmission device for transmission of current association information which indicates that the data communication terminal is associated with the current central data communication device. The current central data communication device includes a reception device for reception of current association information, for reception of current roaming information which indicates a current local data communication device which is connected to a local data communication network to which the data communication terminal is connected. The current central data communication device further includes a storing device for storing of the current association information and the current roaming information, an address handling device for allocation of a temporary address to the data communication terminal and a routing device for routing of data packets, which have the data communication terminal as receiver, to the current local data communication device. The current local data communication device includes a detection device for detection of that the data communication terminal is connected to the local data communication network, a reception device for current association information which indicates the current central data communication device.

The current local data communication device further includes a transmission device for transmission of the current roaming information and a routing device for routing of data packets, which have the data communication terminal as transmitter/sender, to the current central data communication device.

According to the third aspect of the invention a system consequently is provided in which the data communication terminal temporarily is associated to a current central data communication device. The current central data communication device further is not associated only to the current local data communication network to which the data communication terminal is connected. Instead the current local data communication device receives the association information and transmits current roaming information regarding the data communication terminal. The current central data communication device consequently looks after where data packets, which have the data communication device as receiver, shall be routed. Further, a plurality of central data communication devices are utilized which can be arranged regionally in the central data communication network. By this, problems with delays are eliminated which occur in known systems where data packets are routed via a connection node in the home network of the data communication terminal which can be located far from the current local data communication network to which the data communication terminal is connected. The current local data communication device need not allocate any address to the data communication terminal, which address is associated to the local data communication network to which the current local data communication device is connected. Instead, the address is allocated by the current central data communication device. This results in that the data communication terminal can be connected to another local data communication network without any negative influence from data communication

sessions in progress which relate to the data communication terminal.

According to a fourth aspect of the invention a procedure to make possible of roaming for a data communication terminal between local data communication networks which are connected to a central data communication network is provided. According to the procedure, a data communication terminal is associated with a current central data communication device which is connected to the central data communication network. Further a current local data communication device is identified which is connected to a local data communication network to which the data communication terminal is connected and is allocated a temporary address to the data communication terminal. In the current central data communication unit, data packets are routed which have the data communication terminal as receiver, to the current local data communication device.

20 BRIEF DESCRIPTION OF THE DRAWINGS

The invention now will be described in detail in the following with reference to enclosed drawings, in which:

Figure 1 shows an overview of a block diagram over a data communication system in which one embodiment of a system according to the invention is realized;

Figure 2 shows an overview of a block diagram over a central data communication device according to one embodiment of the invention; and

Figure 3 shows an overview of a block diagram over a  
30 central data communication device according to one  
embodiment of the invention.

## DESCRIPTION OF PREFERRED EMBODIMENTS

In Figure 1 a block diagram is shown over a data  
35 communication system in which one embodiment of a system  
according to the invention has been realized. To a central

data communication network 101, for instance an IP-network, such as Internet, two local data communication networks 102 and 103, such as a wireless LAN or a fixed LAN, are connected via a local data communication device each, 110  
5 respective 111. Further there are two central data communication devices 120, 121 and 122 and a central control unit 130 connected to the central data communication network 101. A data communication terminal 140 is shown in Figure 1 connected to the local data  
10 communication network 102.

The local data communication devices 110-111, the central data communication devices 120-122 and the central control unit make roaming possible for the data communication terminal 140 between the local data  
15 communication networks 102-103.

It should be noted that the number of local data communication networks and central data communication devices only has been chosen as examples. These numbers can be arbitrary. It is, however, preferred that the central  
20 data communication devices are arranged regionally in the central data communication network so that they primarily handle roaming between local data communication networks in the region so that the central data communication device, from a transmission point of view, is close to the local  
25 data communication network to which the data communication terminal is connected. The number of central data communication devices therefore normally is fewer than the number of local data communication networks. Further the number of central control units can be more than one.

30 In Figure 2 a block diagram over an embodiment of the central data communication device 120 in Figure 1 is shown. The central data communication device 120 includes a reception device 201 which is arranged to receive current association information which indicates that a data  
35 communication terminal 140 is associated with the central data communication device 120. The reception device 201

further is arranged to receive current roaming information which indicates the IP-address to a current local data communication device 110 which is connected to a local data communication network to which the data communication terminal 140 is connected, and to receive data packets which have the data communication terminal 140 as receiver and the network address (MAC-address) of the data communication terminal 140. The central data communication device 120 further includes a storing device 202 in which the current roaming information and the IP-address of the central control unit 130 are stored. The central data communication device 120 also includes address handling device 203 which is arranged to allocate a temporary IP-address to the data communication terminal 140 and a routing device 204 which routes data packets, which are addressed to the data communication terminal, to the current data communication device. The temporary IP-address is selected among a number of addresses which are specific for the central data communication device 120. The routing device 305 assembles these data packets in a tunneling data packet which has the IP-address of the central data communication device 120 as transmitter/sender address and the IP-address of the current local data communication device 120 as receiver address. Note that the other two central data communication devices 121-122 in Figure 1 are designed in the same way as the central data communication device 120.

In Figure 3 a block diagram over an embodiment of the local data communication device 110 in Figure 1 is shown. The local data communication device 110 includes a detection device 301 for detection of that a data communication terminal 140 is connected to the local data communication network 102 and a reception device 302 for reception of current association information which indicates a current central data communication device 120. The detection device 301 further is arranged to detect that

the data communication terminal 140 ceases to be connected to the local data communication network 102. The local data communication device 110 further includes a storing device 303 for storing of the current association information and a transmission device 304 for transmission of current roaming information which indicates that the data communication terminal 140 is connected to the local data communication network 102 to which the data communication terminal 102 is connected. The transmission device further is arranged to transmit current roaming information which indicates that the data communication terminal has ceased being connected to the local data communication network 102, to which the local data communication device 110 is connected. The local data communication device 110 further includes a routing device 305 for routing of data packets, which have the data communication terminal 140 as transmitter, to the current central data communication device 120. The routing device 305 assembles these data packets in a tunneling data packet which has the IP-address of the local data communication device 110 as transmitter address and the IP-address of the current central data communication device 120 as receiver address. Note that the other/second local data communication device 111 in Figure 1 is designed in the same way as the local data communication device 110.

Below an example when a data communication terminal 140 is started in a local data communication network 102 is described with reference to the Figures 1-3.

Initially all central data communication devices 120-122 and local data communication devices 110-111 are configured with the address to the central control unit 130. At start of a central or local data communication device it will authenticate itself to the central control unit 130 and establishes a secure signal channel to this, for instance by means of a TCP-session over SSL (Secure Socket Layer). The central control unit 130 also receives

information about the geographical location of the data communication device.

The local data communication devices store a list each over network addresses (MAC-addresses) for data communication terminals which are connected to the network. When a local data communication device 110 detects that a data communication terminal 140 is started in the local data communication network 102, which terminal 140 has a network address which does not exist in the list over network addresses of the local data communication device 110, the local data communication device 110 contacts the central control unit 130 and encloses information which uniquely identifies the terminal 140, for instance the physical network address (MAC-address) of the terminal 140 which is permanently programmed on the network card (not shown) of the terminal 140. The local data communication device 110 to which the terminal 140 has been connected is in the following called the current local data communication device 110.

The central control unit 130 acknowledges the user and associates by means of an association device (not shown) a central data communication device 120 at, from a transmission point of view, close distance to the current local data communication device 110. The selected central data communication device 120 is in the following called the current central data communication device 120. The central control unit 130 then transmits by means of a transmission device (not shown) association information which indicates that the data communication terminal 140 is associated with the current data communication device. The current central data communication device 120 then receives the current association information by means of the reception devices 201. Further, the current data communication device 120 is instructed by the central control unit 130 to allocate a logic address to the terminal 140, in this case an IP-address. The current

central data communication device 120 allocates by means of the address handling device 203 to the terminal 140 a free IP-address of a number of IP-addresses which are specific for the current central data communication device 120. The  
5 current central data communication device 120 returns the allocated IP-address to the central control unit 130 if a free IP-address exists. If no free IP-address exists, the central control unit 130 will ask/inquire another central data communication device 121-122.

10 The current central data communication device 120 then stores for the allocated IP-address the network address (MAC-address) of the data communication terminal, the IP-address to the current local data communication device 110 and the IP-address to the central control unit which has  
15 made the inquiry. This is made in the storing device 202 for each allocated IP-address.

The central control unit 130 then forwards the allocated IP-address to the current local data communication device 110, which in its turn forwards it to  
20 the data communication terminal 140.

The current local data communication device 110 then registers the network address of the data communication terminal 140 in the list over network addresses for connected terminals which it keeps up/maintains.

25 After this, communication can be executed to the data communication terminal 140 by data packets which are addressed to it being transmitted to the current central data communication device 120, which then tunnels the data packets to the current local data communication device 110.  
30 In opposite direction, the current local data communication device 110 tunnels data packets from the data communication terminal to the current central data communication device 120, which forwards the packets to the receiver.

Below is described an example when a data  
35 communication terminal 140, which already has been started,



is connected to a local data communication network 102 with reference to the Figures 1-3.

When a local data communication device 110 detects that a data communication terminal 140 is connected to the  
5 local data communication network 102, is noted that the network address of the terminal 140 does not exist in the list over network addresses of the local data communication device 110. The local data communication device 110 then contacts the central control unit 130 and encloses  
10 information which uniquely identifies the terminal 140, for instance the physical network address (MAC-address) of the terminal 140, which is permanently programmed on the network card (not shown) of the terminal 140. The local data communication device 110 to which the terminal 140 has  
15 been connected is in the following called the current local data communication device 110.

The central control unit 130 acknowledges the user and notes from which central data communication device the data communication terminal has received its IP-address. This  
20 central data communication device 120 is in the following called the current central data communication device 120. If the current central data communication device has not received current roaming information, which indicates that the data communication terminal 140 has ceased to be  
25 connected to a previous local data communication network, the local data communication device, which is connected to this previous local data communication network, asks if the data communication terminal is connected to this previous local data communication network. The answer to this shall  
30 in the normal case be no.

According to one embodiment of the invention, the local data communication device, which is connected to the previous local data communication network, has detected that the data communication terminal 140 has ceased to be  
35 connected to the previous local data communication network. This local data communication device then to the current

central data communication device 120 has transmitted current roaming information, which indicates that the data communication terminal 140 no longer is connected to the previous local data communication network. The current  
5 central data communication device 120 then has cut off the routing of data packets, which are addressed to the data communication terminal, to the previous data communication network and instead buffered these data packets.

The current central data communication device stores  
10 the IP-address to the current local data communication device 110 and transmits the IP-address of the data communication terminal 140 to the current local data communication device 110. The central data communication terminal 120 further will route data packets which are  
15 addressed to the data communication terminal 140, to the current local data communication device, and the current local data communication device 110 will route data packets, which are transmitted from the data communication terminal 140, to the current central data communication  
20 device 120.

Below an example when a data communication terminal 140 ceases to be connected to any local data communication network is described with reference to the Figures 1-3.

When a current local data communication device 110,  
25 which is connected to a local data communication network 102, detects that the data communication terminal has ceased to be connected to the local data communication network 102, it transmits current roaming information, which indicates this to the current central data  
30 communication device 120. The current central data communication device 120 breaks the routing of data packets, which are addressed to the data communication terminal, to the current local data communication device 110. The detection is made, for instance, by the current  
35 local data communication device 110 periodically using the function ping with regard to the data communication

terminals which are indicated in the list over data communication terminals which are stored in the current local data communication device 110. If a data communication terminal is not accessible, the current local  
5 data communication device 110 will delete this data communication terminal from its list and inform the current central data communication device 120.

If the current central data communication device 120 then during one in advance defined period of time does not  
10 receive any current roaming information, which indicates that the data communication terminal 140 has been connected to a new local data communication network, it will set the IP-address free which the data communication terminal has been allocated, at which this address is accessible for  
15 allocation.

## PATENT CLAIMS

1. Data communication device (120), which is connected to a central data communication network (101), for making possible of roaming for a data communication terminal (140) between local data communication networks (102,103) which are connected to the central data communication network (101) including;

a reception device (201) for reception of current association information, which indicates that the data communication terminal is associated with the data communication device, and for reception of current roaming information, which indicates a current local data communication device (110), which is connected to a local data communication network, to which the data communication terminal is connected;

a storing device (202) for storing of the current association information and the current roaming information;

an address handling device (203) for allocation of a temporary address to the data communication terminal; and

a routing device (204) for routing of data packets, which have the data communication terminal as receiver, to the current local data communication device, at which

the address handling device, in the current central data communication device, is arranged to be allocated a temporary address, of a plurality of addresses which are specific for the current central data communication device, and the identification device in the current local data communication device is arranged to store information about which addresses that are specific for the current central data communication device, and to identify the current central data communication device on basis of the address of the data communication terminal.

2. Data communication device as claimed in patent claim 1, at which the address handling device is arranged to allocate a temporary address of a plurality of addresses which are specific for the data communication device.

5

3. Data communication device as claimed in patent claim 1 or 2, at which the current roaming information further indicates if the data communication terminal ceases to be connected to a local data communication network to which the current local data communication device is connected,

and the routing device further is arranged to cut off/stop the routing of data packets, which have the data communication terminal as receiver, to the current local data communication device when the current roaming information indicates that the data communication terminal ceases to be connected to the local data communication network to which the current local data communication device is connected.

20

4. Data communication device as claimed in patent claim 3, at which the address handling device is arranged to set the temporary address free after one in advance defined period of time from the reception of the current roaming information, which indicates that the data communication terminal has ceased to be connected to the local data communication network to which the current local data communication device is connected, provided that no current roaming information, which indicates a new current local data communication device, which is connected to a local data communication network, to which the data communication terminal is connected, has been received/obtained meanwhile.

35

5. Data communication device as claimed in any of the patent claims 1-4, at which the current roaming information

indicates the address to the current local data communication device, and the routing device is arranged to assemble received data packets, which have data communication terminal as receiver, in a tunneling data packet each, which has the address of the data communication device as transmitter/sender address and the address of the current local data communication device as receiver address.

10           6. Data communication device (110), which is connected to a local data communication network (102) and to a central data communication network (101), for making possible of roaming for a data communication terminal (140) between local data communication networks (102,103),  
15 including:

          a detection device (301) for detection of that the data communication terminal is connected to the local data communication network;

          a reception device (302) for reception of current  
20 association information, which indicates a current central data communication device (120), to which the data communication terminal is associated;

          a storing device (303) for storing of the current association information;

25           a transmission device (304) for transmission of current roaming information, which indicates that the data communication terminal is connected to the local data communication network; and

          a routing device (305) for routing of data packets,  
30 which have the data communication terminal as transmitter/sender, to the current central data communication device, and

          the address handling device, in the current central data communication device, is arranged to allocate a  
35 temporary address of a plurality of addresses which are specific for the current central data communication device,

and the identification device in the current local data communication device is arranged to store information regarding which addresses that are specific for the current central data communication device and to identify the  
5 current central data communication device on basis of the address of the data communication terminal.

7. Data communication device as claimed in patent claim 6, at which the detection device further is arranged  
10 to detect that the data communication terminal ceases to be connected to the local data communication network, and the transmission device further is arranged to transmit/send current roaming information which further indicates that the data communication terminal has ceased to be connected  
15 to the local data communication network.

8. Data communication device as claimed in patent claim 6 or 7, at which the routing device is arranged to assemble data packets, which have the data communication  
20 terminal as transmitter/sender, in a tunneling packet each which has the address of the data communication device as transmitter/sender address and the address of the current central data communication device as receiver address.

25 9. System for making possible of roaming for a data communication terminal (140) between local data communication networks (102,103) which are connected to a central data communication network (101), including:

local data communication devices (110,111), which are  
30 connected to a local data communication network (102,103) each, and to the central data communication network;

central data communication devices (120,121,122), which are connected to the central data communication network; and

35 a central control unit (130), which is connected to the central data communication devices via the central data

communication network, which includes association device for association of the data communication terminal with a current central data communication device; and

transmission device for transmission to the current  
5 central data communication device of current association information, which indicates that the data communication terminal is associated with the current central data communication device,

which current central data communication device  
10 includes a reception device (201) for reception of current association information, and for reception of current roaming information, which indicates a current local data communication device (110), which is connected to a local data communication network (102), to which the data  
15 communication terminal is connected; a storing device (202) for storing of the current association information and the current roaming information; an address handling device (203) for allocation of a temporary address to the data communication terminal; and a routing device (204) for  
20 routing of data packets, which have the data communication terminal as receiver, to the current local data communication device,

which current local data communication device includes a detection device (301) for detection of that the data  
25 communication terminal is connected to the local data communication network; a reception device (302) for reception of current association information which indicates the current central data communication device; a storing device (303) for storing of the current association  
30 information; a transmission device (304) for transmission of the current roaming information; and a routing device (305) for routing of data packets, which have the data communication terminal as transmitter/sender, to the current central data communication device,

35 the address handling device, in the current central data communication device, is arranged to allocate a



temporary address of a plurality of addresses which are specific for the current central data communication device, and the identification device in the current local data communication device is arranged to store information  
5 regarding which addresses that are specific for the current central data communication device, and to identify the current central data communication device on basis of the address of the data communication terminal.

10 10. System as claimed in patent claim 9, at which the detection device in the current local data communication device further is arranged to detect that the data communication terminal ceases to be connected to the local data communication network, and the transmission device  
15 further is arranged to transmit current roaming information, which further indicates that the data communication terminal has ceased to be connected to the local data communication network, and the routing device in the current central data communication device further is  
20 arranged to cut off/stop the routing of data packets, which have the data communication terminal as receiver, to the current local data communication device when the current roaming information indicates that the data communication terminal ceases to be connected to the local data  
25 communication network to which the current local data communication device is connected.

11. System as claimed in patent claim 10, at which the address handling device in the current central data  
30 communication device is arranged to set the temporary address free after one in advance specified period of time from reception of current roaming information, which indicates that the data communication terminal has ceased to be connected to the local data communication network to  
35 which the current local data communication device is connected, provided that no current roaming information,

which indicates a new current local data communication device, which is connected to a local data communication network, to which the data communication terminal is connected, has been received during the in advance  
5 specified time.

12. System as claimed in any of the patent claims 9-11, at which the current roaming information further indicates the address to the current local data  
10 communication device, and the routing device in the current central data communication device is arranged to assemble data packets, which have the data communication terminal as receiver, in a tunneling data packet each which has the address of the current central data communication device as  
15 transmitter address and the address of the current local data communication device as receiver address, and the routing device for the current local data communication device is arranged to assemble data packets, which have the data communication terminal as transmitter, in a tunneling  
20 data packet each, which has the address of the current local data communication device as transmitter/sender address, and the address of the current central data communication device as receiver address.

25 13. Procedure for making possible of roaming for a data communication terminal between local data communication networks which are connected to a central data communication network, including the steps:  
to associate a data communication terminal with a  
30 current central data communication unit which is connected to the central data communication network,  
to allocate a temporary address to the data communication terminal;  
to identify a current local data communication device,  
35 which is connected to a local data communication network, to which the data communication terminal is connected; and

to, in the current central data communication unit,  
route a data packet, which has the data communication  
terminal as receiver, to the current local data  
communication device,

5       that the address handling device, in the current  
central data communication device, is allocated a temporary  
address of a plurality of addresses, which are specific for  
the current central data communication device, and the  
identification device, in the current local data  
10   communication device, stores information about which  
addresses that are specific for the current data  
communication device and that the central communication  
device is identified on basis of the address of the data  
communication terminal.

15

14. Procedure as claimed in patent claim 13, at which  
the temporary address, which is allocated in the step to  
allocate a temporary address, is one of a plurality of  
addresses which are specific for the current central data  
20   communication device.

15. Procedure as claimed in patent claim 14, further  
including the steps:

to identify the current central data communication  
25   device as the central data communication device for which  
the address of the data communication terminal is specific.

16. Procedure as claimed in patent claim 15, at which  
the step to identify a current local data communication  
30   network includes the steps:

to, in a local data communication device, detect that  
the data communication terminal is connected to a local  
data communication network to which the local data  
communication device is connected;

35       to, to the current central data communication device,  
transmit current roaming information, which indicates a

current local data communication device, which is connected to the local data communication network, to which the data communication terminal is connected.

5 17. Procedure as claimed in patent claim 16, further including the steps:

to in the current local data communication device detect that the data communication terminal ceases to be connected to the local data communication network to which  
10 the current local data communication device is connected;

to, to the current central data communication device transmit current roaming information, which indicates that the data communication terminal has ceased to be connected to the local data communication network to which the  
15 current local data communication device is connected; and

to cut off/stop the routing of data packets, which have the data communication terminal as receiver, to the current local data communication device after detection of that the data communication terminal ceases to be connected  
20 to the local data communication network to which the current local data communication device is connected.

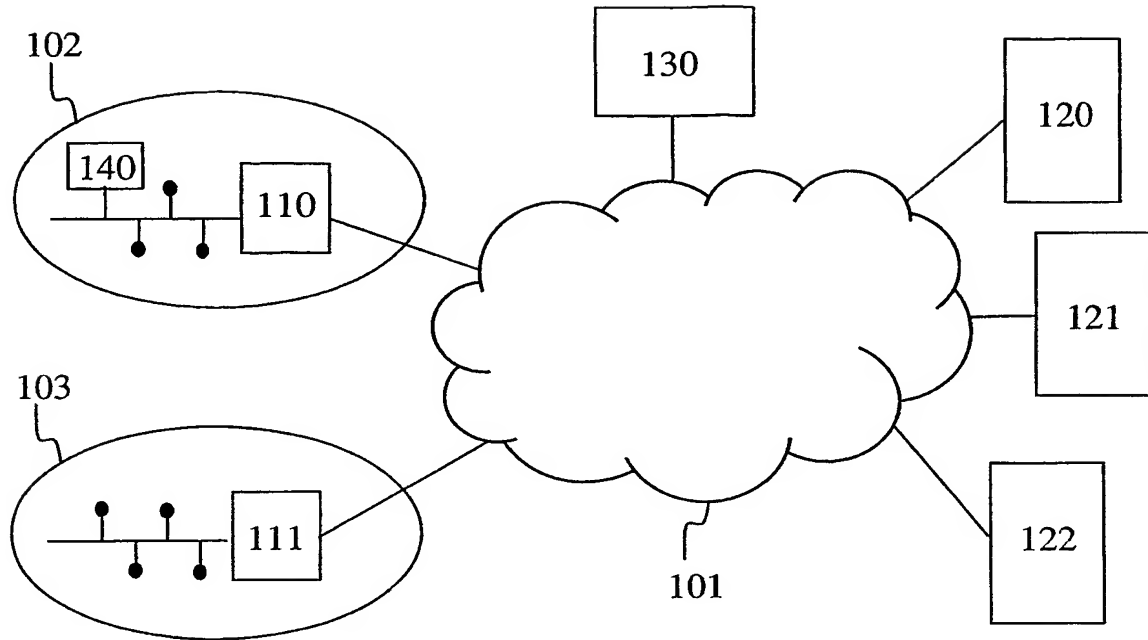
18. Procedure as claimed in patent claim 17, further including the step:

25 to set the temporary address free after one in advance defined period of time from the detection of that the data communication terminal has ceased to be connected to the local data communication network to which the current local data communication device is connected, provided that no  
30 identification of a new current local data communication device which is connected to a local data communication network to which the data communication terminal is connected has been made during the in advance defined period of time.

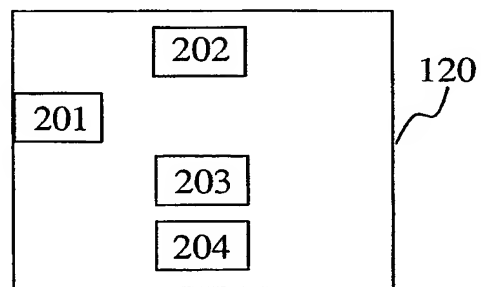
35

19. Procedure as claimed in any of the patent claims 16-18, further including the step:

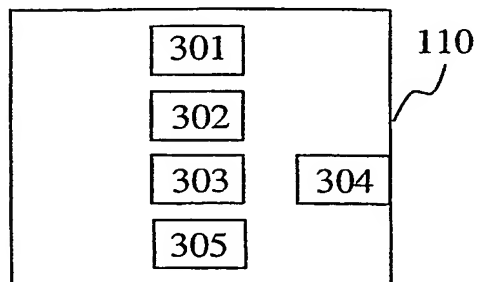
to, in the current local data communication device, route data packets, which have the data communication  
5 terminal as transmitter/sender, to the current central data communication device.



**Figure 1**



**Figure 2**



**Figure 3**

## INTERNATIONAL SEARCH REPORT

International application No.

PCT/SE 02/02110

## A. CLASSIFICATION OF SUBJECT MATTER

IPC7: H04Q 7/38, H04L 12/56

According to International Patent Classification (IPC) or to both national classification and IPC

## B. FIELDS SEARCHED

Minimum documentation searched (classification system followed by classification symbols)

IPC7: H04Q, H04L

Documentation searched other than minimum documentation to the extent that such documents are included in the fields searched

SE,DK,FI,NO classes as above

Electronic data base consulted during the international search (name of data base and, where practicable, search terms used)

EPO-INTERNAL, WPI DATA

## C. DOCUMENTS CONSIDERED TO BE RELEVANT

Category*	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
A	WO 0131472 A1 (TELCORDIA TECHNOLOGIES, INC.), 3 May 2001 (03.05.01), page 9, line 24 - page 13, line 4; page 18, line 14 - page 21, line 13; page 26, line 5 - line 23, page 32, line 20 - page 34, line 10, figures 1-12, claims 1-16, abstract  --	1-19
A	WO 0176188 A2 (BRITISH TELECOMMUNICATIONS), 11 October 2001 (11.10.01), page 2, line 22 - page 5, line 8; page 6, line 33 - page 7, line 16, figures 1-37, claims 1-6, abstract  --	1-19
A	US 5819178 A (CROPPER), 6 October 1998 (06.10.98), column 2, line 38 - column 3, line 14, figures 1-6, claims 1-20, abstract  --	9,10

☒ Further documents are listed in the continuation of Box C.☒ See patent family annex.

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## INTERNATIONAL SEARCH REPORT

International application No.

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## C (Continuation). DOCUMENTS CONSIDERED TO BE RELEVANT

Category*	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
A	WO 0011881 A2 (SIEMENS AKTIENGESELLSCHAFT), 2 March 2000 (02.03.00), page 1, line 26 - page 3, line 29; page 9, line 5 - line 18, figure 1, claims 1-6, abstract  --	1-19
A	WO 9721313 A1 (NORTHERN TELECOM LIMITED), 12 June 1997 (12.06.97), figures 1-3, abstract  -- -----	1-19



# INTERNATIONAL SEARCH REPORT

Information on patent family members

International application No.

PCT/SE.02/02110

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